

CREPIS MODOCENSIS var. *subacaulis* (Kellogg) comb. nov. *C. occidentalis* var. *subacaulis* Kellogg, Proc. Calif. Acad. Sci. 5: 50. 1873. (p. 805)

CREPIS ATRIBARBA var. *originalis* (Babc. & Steb.) comb. nov. *C. atribarba* subsp. *originalis* Babc. & Steb., Carneg. Inst. Wash. Publ. 504: 162. 1938. (p. 806)

CREPIS OCCIDENTALIS var. *pumila* (Rydb.) comb. nov. *C. pumila* Rydb., Mem. N. Y. Bot. Gard. 1: 462. 1900. (p. 806)

CREPIS BAKERI var. *Cusickii* (Eastw.) comb. nov. *C. Cusickii* Eastw., Bull. Torr. Club 30: 502. 1903. (p. 806)

Willamette University,
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AN UNDESCRIBED SPECIES OF STIPA FROM CALIFORNIA

G. L. STEBBINS, JR., AND R. M. LOVE

Due to the growing interest in the native forage plants of California, particular attention is now being given by a number of workers to *Stipa pulchra* Hitchc., one of the most common and valuable of the native perennial forage grasses in the valley and foothill regions of this state. Several people, including the present writers, have noticed that this species as recognized in the current manuals actually consists of two distinct types. One, with deep green foliage, relatively broad leaves, stiffer panicle branches, large glumes, thick, fusiform lemmas, and stout, stiff awns, is predominant in the outer Coast Ranges and the wooded parts of the Sierra Nevada foothills. This is typical *S. pulchra*, of which the type came from Healdsburg, Sonoma County. The other form, with somewhat glaucous foliage, narrower leaves, flexuous, often nodding panicle branches, smaller, narrower glumes, slender lemmas, and slender, often flexuous awns, occurs chiefly in the treeless parts of the inner Coast Ranges, the San Joaquin Valley (in scattered areas undisturbed by cultivation), the valleys of southern California, and the edges of the deserts. The two types have been given different common names, typical *S. pulchra* being known as purple needle grass, and the slender, interior type as nodding needle grass. The writers have observed these two needle grasses carefully during two seasons of collecting in the field, have grown and compiled extensive morphological data on several cultures of each, and have examined their chromosomes at both mitosis and meiosis. From these observations enough evidence has accumulated to warrant the recognition of the interior type as a distinct species. It may be described as follows.

Stipa cernua sp. nov. Folia glauca angusta; panicula ampla, ramis tenuis, flexuosis, cernuis; glumae inaequales, 12–19 mm. longae, 1–1.4 mm. latae, pallidae vel roseo-purpureae, semper 3-nervatae; lemma angusta, 5–10.5 mm. longa, cum fructu 0.6–1



FIG. 1. Distribution of *Stipa pulchra* and *S. cernua*.

mm. crassa, ad basim et supra nervis pubescens, parte superiore glabra; arista 6–11 cm. longa, flexuosa, scabra vel ad basim pubescens.

Mostly in large clumps, the basal leaves numerous, narrow, usually glaucous; culms several, mostly 60 to 90 cm. tall, middle culm leaves 1.2–2.4 mm. broad. Panicle ample, the basal portion often within the lowermost leaf sheath; panicle branches slender and flexuous or cernuous; glumes scarious, pale or reddish purple, long acuminate, the lower 12–19 mm. long, the upper somewhat shorter and broader, 1–1.6 mm. broad, both strictly 3-nerved; lemma 5–10.5 mm. long, 2.2–2.9 mm. broad when unrolled, with caryopsis 0.6–1 mm. thick at maturity, 5- or sometimes 7-nerved, the callus acute, pubescence dense on the callus and on the lower

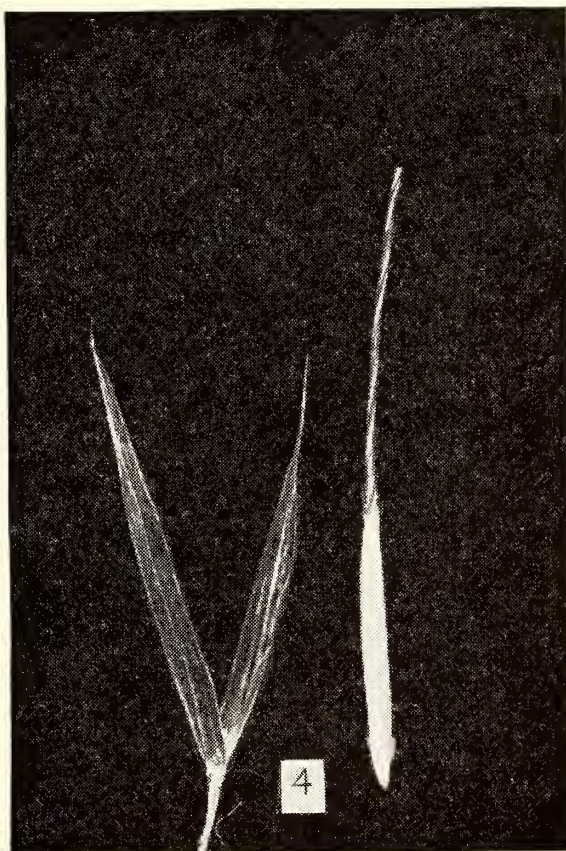
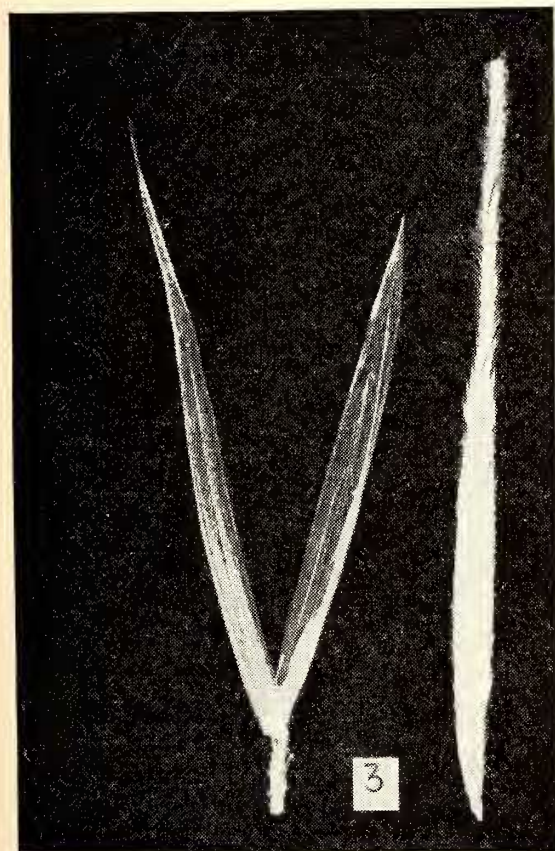
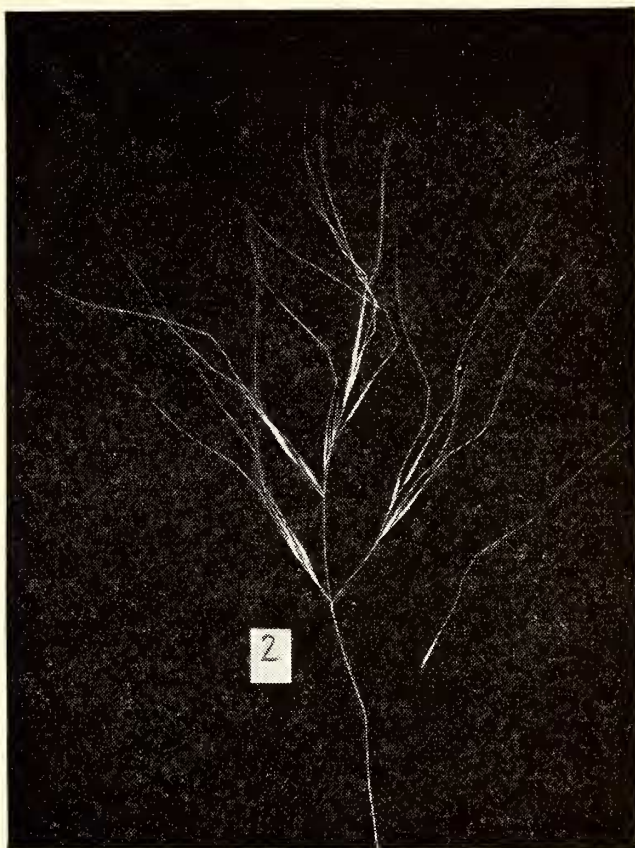


PLATE 13. INFLORESCENCE AND FLORETS IN STIPA. FIG. 1. *Stipa pulchra* Hitchc., from Berkeley (*Stebbins 2670*), panicle branch $\times .33$. FIG. 2. *S. cernua*, from Santa Barbara County (*Stebbins 2875*), panicle branch $\times .33$. FIG. 3. *S. pulchra*, from Berkeley, glumes and lemma $\times 3.3$. FIG. 4. *S. cernua*, type collection, glumes and lemma $\times 3.3$.

TABLE 1

Comparison of the Principal Characteristics of *Stipa pulchra* and *Stipa cernua*

	<i>S. pulchra</i>	<i>S. cernua</i>
Width of next to uppermost culm leaf	2.4-6 mm.	1.2-2.4 mm.
Color of leaves	deep green	glaucous
Character of panicle branches	spreading, or slightly cernuous	slender, flexuous, or cernuous
Length lower glume	15-26 mm.	12-19 mm.
Width upper glume	1.4-2.2 mm.	1.0-1.6 mm.
Number of nerves on upper glume	3-5	3
Length of lemma	7.5-13 mm.	5.0-10.5 mm.
Width of lemma (unrolled) .	3.3-4.8 mm.	2.2-2.9 mm.
Number of nerves on lemma	5-9	5-7
Thickness of mature caryopsis including lemma	1.0-1.4 mm.	0.6-1.0 mm.
Pubescence of lemma	throughout, or at base and on nerves to middle or summit	at base and on nerves one-third to four-fifths of way to summit
Length of awn	60-90 mm.	60-110 mm.
Ratio of awn to lemma	5.9-9.8	8.7-14.5
Pubescence of awn below first bend	pubescent	scabrous or slightly pubescent

one-fifth to one-fourth of the body of the lemma, the upper part of the lemma scabrous and with the nerves pubescent one-third to four-fifths of the distance to the summit, lemma usually pale straw- or buff-colored, occasionally purplish, brownish, or blackish; awn 6-11 cm. long, 8.7-14.5 times the length of the lemma, twice bent at maturity, slender and flexuous beyond the second bend, scabrous or short-pubescent below the first bend.

California, from Tehama County south to San Diego County east to the Sierra Nevada foothills, reaching the coast from Monterey southward, and extending up to about 1360 meters (4500 feet) altitude in southern California.

Type. West side of Cedar Mountain Ridge, southeast of Livermore, Alameda County, altitude 400 meters (1300 feet), *G. L. Stebbins, Jr. 2732*, (Herb. Univ. Calif. 641631). The following specimens in the University of California Herbarium are also typical: west of Orland, Glenn County, *Heller 11434*; Nacimiento River, Monterey County, *Davy 7688*; Santa Barbara, *Elmer 3874*; Mount Pinos, Ventura County, *Hall 6426*; Mint Canyon, east of Saugus, Los Angeles County, *Munz 6794*; near Rialto, San Bernardino County, *S. B. & W. F. Parish 2038*; San Bernardino Valley, *Parish 6204, 11257*; near Winchester, Riverside County, *Hall 2921*; Box Springs Mountain, Riverside County, *Hall 2977*; San Diego, *Brandegge 833*.

As mentioned previously, *Stipa cernua* is most closely related to *S. pulchra*. The differences between the two species are sum-

marized in Table 1, and partly illustrated in plate 13. The following may be used as convenient key characters:

Leaves green, the middle culm leaves 2.4–6 mm. broad; lemmas fusiform, with caryopsis 1–1.4 mm. thick at maturity; awn stout and stiff, mostly 7–9 times as long as the lemma	<i>S. pulchra</i>
Leaves somewhat glaucous, the middle culm leaves 1.2–2.4 mm. broad; lemmas slender, with caryopsis 0.6–1 mm. thick at maturity; awn slender, flexuous beyond the second bend, mostly 9–12 times the length of the lemma	<i>S. cernua</i>

The distribution of the two species, as determined by the collections and observations of the writers as well as by the specimens in the University of California Herbarium, is shown in figure 1. It will be seen that they occur together throughout a rather large area, and can often be found growing side by side. In these places they are usually quite distinct, but forms intermediate between them do occur. The writers studied particularly these intermediate plants as found in two localities near San Benito, San Benito County, and found them to be completely sterile or nearly so. Although the surrounding plants of *S. pulchra* and *S. cernua* were producing good seed in abundance, not a single fertile grain was found on any of the intermediates. The latter showed considerable hybrid vigor, often forming clumps much larger than those of the parent species. In the University of California Herbarium there are three specimens of such sterile intermediates: north base of Mount Hamilton, Santa Clara County, *Sharsmith 664A*; Pacific Grove, Monterey County, *Elmer 3507*; Las Flores Canyon, Santa Monica Mountains, Los Angeles County, *Epling* in 1930. Only the latter specimen had anthers with pollen for examination; in it 5 per cent of the pollen grains were large and well filled with cytoplasm, as contrasted with 90–96 per cent in typical *S. pulchra* and *S. cernua*.

The chromosome numbers of the two species are reported elsewhere as $2n = 64$, $n = 32$ for *S. pulchra*, and $2n = 70$, $n = 35$ for *S. cernua* (Stebbins and Love, *Am. Jour. Bot.* 28: 371–382. 1941). Three of the sterile intermediate plants from San Benito were dug up and transplanted to pots in Berkeley, and their somatic chromosome number was determined as $2n = 67$, indicating that they are actually first generation hybrids between *S. cernua* and *S. pulchra*. Their meiosis will be studied during the coming season.

Except for *S. pulchra*, *S. cernua* has no close relative among the North American species of *Stipa*. It resembles *S. comata* in its glaucous leaves and long awns, but that species has large, thick lemmas as in *S. pulchra*, and lacks the collar at the apex of the lemma which is found in both *S. pulchra* and *S. cernua*. It is possible that *S. cernua* is related to some of the numerous South American species of *Stipa*, but the present writers have not seen adequate material of any of them to judge their relationships.

College of Agriculture,
University of California, Berkeley,
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